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by  
Sweder van Wijnbergen

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Eric van Damme  
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Arie Kapteyn

**Address** : Warandelaan 2, P.O. Box 90153, 5000 LE Tilburg, The Netherlands  
**Phone** : +31 13 663050  
**Telex** : 52426 kub nl  
**Telefax** : +31 13 663066  
**E-mail** : "center@htikub5.bitnet"

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## INTERTEMPORAL SPECULATION, SHORTAGES AND THE POLITICAL ECONOMY OF PRICE REFORM\*

*Sweder van Wijnbergen*

How should prices be decontrolled, slowly or in a big bang? Why is it that Governments committed to eventual price flexibility so often seem to be unable to let go of 'temporary' controls? How can one explain that after price increases early in a programme of price controls, output often rises while at the same time shortages also increase (Bresser, 1987)? This paper argues that intertemporal speculation, hoarding and the political economy of price reform go a long way towards explaining all these puzzles. We show that the interaction between shortages and political vulnerability of reformist governments to early perceptions of failure make for a strong argument *against* gradualism in the decontrol of prices.

Price controls are often used as substitutes for, rather than complements of, regular fiscal and monetary restraint; they thus ended up suppressing rather than curing inflation. More recently they have seen more sophisticated use, as transitional devices in stabilisation programmes that also encompassed orthodox components (Mexico and Israel are successful examples).

The literature on price controls has focused on their potential macro-economic rationale (Dornbusch and Simonsen, 1987; Persson and van Wijnbergen, 1989). This paper abstracts from the question of why price controls are used. Instead it asks a different question, one that is perhaps of greater practical importance: how to escape from a period of controls? The issue is of much wider importance than the stabilisation policy examples suggest; all of Eastern Europe has been living under price controls, imposed for a very different reason. How should countries like Poland or the ex-USSR move towards price flexibility, gradually or in a 'big bang'?

Two factors complicate the issue. Often price controls focus on commodities that are storable and thus can be used in intertemporal speculation. This was acute in Brazil, where in 1985 price controls were introduced which were very much seen as temporary. Bresser (1987), who was the finance minister at the time, states: 'There was shortage of merchandise in stores at the [same] time that stocks were accumulating in the factories'.

The second factor is that opposition to rapid dismantling of controls is often based on claims of low supply response, and greatly bolstered if a strong supply

\* For elaboration on some of the more technical details of this paper the reader is referred to the working paper version (van Wijnbergen, 1991), which is available on request from the author. I am indebted to Max Corden, Alex Cukierman, Antonio Estache, Arye Hillman, Santiago Levy, Dani Rodrik, Lars Svensson and seminar participants at the World Bank, the IMF, Princeton, Pennsylvania State and the Wharton School for helpful comments. The views expressed in this paper do not necessarily coincide with those of the institutions I am affiliated with.

response indeed fails to materialise. This is especially relevant in places like Eastern Europe, where experience with price responsive markets is limited. A less benign argument also lends support to a link between low supply response and opposition to relaxing controls. Shortages create rents, and rents will attract lobbyists in favour of continuation of those policies that create the rents.

We show the difficulties that these two factors create for gradual decontrol of prices. We endogenise the probability of a collapse of the reform programme along the lines of the recent literature about the impact of political considerations on economic policy (see in particular Alesina and Cukierman (1990)) and show that such endogeneity in the presence of intertemporal speculation leads to a strong case *against* gradualism.

## I. SPECULATION AND SUPPLY RESPONSE TO GRADUAL PRICE DECONTROL

### I.1. *The Basic Model*

The traded sector uses labour only, and at constant returns to scale; thus the real wage  $w$  is fixed in terms of traded goods. Returns to scale are decreasing in the non-traded sector, because of a fixed factor in the background (land). There are many producers, so individual producers cannot affect the price, or, in the case of controls, aggregate shortages. Non-traded output today equals  $Y$ , and output tomorrow  $y$ . The cost function for current (future) non-traded production equals  $C$  ( $c$ ):

$$\left. \begin{aligned} C &= C(w, Y); \quad C_w, C_Y, C_{YY} > 0 \\ c &= c(w, y); \quad c_w, c_y, c_{yy} > 0. \end{aligned} \right\} \quad (1)$$

Capital (lower case) letters represent first (second) period variables.

Output produced today can be sold today or stored for sale tomorrow. Since there are only two periods, output produced tomorrow will be fully sold. Goods stored today,  $S$ , lead to goods available from storage in period 2 according to the technology  $\phi$ :

$$s = \phi(S); \quad \phi(0) = 0, \quad 0 < \phi' < 1, \quad \phi'' < 0. \quad (2)$$

Part of goods stored goes to waste due to spoilage, pests and so on. Thus there are positive marginal costs of storage ( $\phi' < 1$ ). We also assume that the marginal costs increase with the amount stored ( $\phi'' < 0$ ).

The market clearing price in period 1 (2) is  $P^*$  ( $p^*$ ). Controls are imposed in the non-traded sector only. Before the announcement of decontrol, prices were set at  $P_0 = p_0 < P^*, p^*$ . *Cold turkey decontrol* implies immediate transition to market prices in both periods. *Gradual decontrol* implies a price increase in period 1 that falls short of going to market prices:  $P_g < P^*$ ; while a full move to market prices is announced for period two.

Call  $\rho$  the probability that the decontrol program will be abandoned. We assume that when the programme of gradual decontrol is abandoned in period 2, the controls will be kept at their level of period 1, i.e. in that case  $p_g = P_g$ . A



collapse of the cold turkey decontrol programme does not have such an obvious default position; we assume that if the cold turkey programme collapses, prices in period two will be set at the pre-decontrol level  $P_0$ . Both producers and consumers take  $p$  as given.

Producers have to choose today's output and level of inventories before knowing whether the Government will implement its announcements for period two or whether the programme will collapse halfway. However second period output can be chosen after period 2 Government policies have become clear. The second period production decision is thus a simple static optimisation problem:

$$\left. \begin{aligned} \text{No collapse: } \max_{y^*} \{ p^* [y^* + \phi(S)] - c(w, y^*) \} \rightarrow C_y(y^*) = p^*, \\ \text{Collapse: } \max_{y_c} \{ P_g [y_c + \phi(S)] - c(w, y_c) \} \rightarrow c_{y_c}(y_c) = P_g. \end{aligned} \right\} \quad (3)$$

In general  $p_g^* \neq p_{ct}^*$ . We will however omit the subscript.

In period one producers have to choose output  $Y$  and the part of output put in storage,  $S$ , knowing that in period two they will follow the rules laid out in (3). This leads to the following maximisation problem:

$$\max_{Y, S} (Y - S) P_g - C(w, Y) + \delta \mathcal{E} \{ [y + \phi(S)] p - c(w, y) \} \text{ subject to } 0 \leq S \leq Y \quad (4)$$

$\delta = 1/(1+r)$  with  $r$  the exogenous world real interest rate in terms of traded goods.  $\mathcal{E}$  is the expectations operator. The first order conditions are:

$$\left. \begin{aligned} C_Y = P_g + \mu, \\ -P_g + \delta \phi' \mathcal{E}_g p + \lambda - \mu = 0. \end{aligned} \right\} \quad (5)$$

$\lambda(\mu)$  is the shadow price associated with the constraint  $S > 0 (S < Y)$ . (5) indicates that output will be increased until its marginal cost equals the value of an extra unit of output. This latter value equals the price plus any additional shadow price picked up by inventories if they are constrained by the fact that additions to inventories cannot exceed total production.

Inventories are chosen so as to equalise the value of an extra unit of output today ( $P_g$ ) with the discounted value of an extra unit tomorrow ( $\delta \phi' \mathcal{E}_g p$ ). Of course if inventories hit a corner solution (0 or  $Y$ ), that equality cannot be brought about and either  $\lambda$  or  $\mu$  becomes positive, driving a wedge between the marginal benefit of an extra sale today versus an extra sale tomorrow. Clearly, higher prices lead to higher output in each period:

$$\frac{dY}{dP_g} = C_{Y1}^{-1} > 0; \quad \frac{dy^*}{dp^*} = c_{yy}^{-1}(y^*) > 0; \quad \frac{dy_c}{dP_g} = c_{yy}^{-1}(y_c) > 0. \quad (6)$$

The analysis for 'cold turkey' decontrol follows along similar lines.

The consumer chooses between Traded and Non-Traded goods each period, and allocates expenditure over today and tomorrow. An expenditure function

describes aggregate consumer behaviour<sup>1</sup>; without rationing, this function gives the minimum level of expenditure necessary to reach welfare level  $U$ :

$$E = E[\Pi(P^*, 1), \delta\pi(p^*, 1), U]. \quad (7)$$

The derivatives of  $E$  with respect to prices yield the Hicksian demand functions.  $\Pi$  and  $\pi$  are exact price indices for current and future consumption corresponding to the utility structure underlying (7). However, when price controls are binding, consumer demand is not met at quoted prices. Define *virtual* prices as the prices at which consumers would willingly consume the rations allocated (see Neary and Roberts (1980)):

$$P_v: \frac{\partial E[\Pi(P_v, 1), \dots]}{\partial P} = A_R^h; \quad p_v: \frac{\partial E[\dots, \pi(p_v, 1), U]}{\partial p} = a_r^h, \quad (8)$$

where  $A_R^h$  ( $a_r^h$ ) is the ration allocated in period 1 (period 2).

Under gradualism, consumers' intertemporal budget constraint is:

$$Y_T + P_g(Y - S) - C + \delta\mathcal{C}_g[p(y + s) - c] = E \quad (9)$$

while under a cold turkey approach we get:

$$Y_T + P^*(Y - S) - C + \delta\mathcal{C}_{ct}[p(y + s) - c] = E \quad (10)$$

$Y_T$  is output in the  $T$  sector. The welfare gain due to a small increase in the ration is proportional to the wedge between controlled and virtual prices:

$$E_U \frac{dU}{dA_R^h} = (P_v - P_g). \quad (11)$$

For given collapse probability  $\rho$  (which will be endogenised in the next section), the model is closed in each period by either a market clearing equation for the  $NT$  market in case market prices prevail, or by an equation defining virtual prices if price controls are operating and binding (equations (8)). Without price controls, market prices follow from  $NT$  market equilibrium:

$$\left. \begin{aligned} Y - S &= \frac{\partial E}{\partial P} \\ y + \phi(S) &= \frac{\partial E}{\partial p} \end{aligned} \right\} \quad (12)$$

## 1.2. Aggregate Supply Response, Hoarding and Gradualism

Consider first the case where the inventory problem has an interior solution  $S^*$ , and  $\lambda = \mu = 0$  (Fig. 1); van Wijnbergen (1991) shows that if  $S^*$  exists, it is unique. Differentiating (5) indicates the relation between the optimal level of hoarding  $S^*$  and the collapse probability  $\rho$ :

$$\left. \frac{dS}{d\rho} \right|_{\frac{\mathcal{W}_{p_g}^{\mathcal{C}_g}}{P_g} - 1} = \frac{\phi'(p^* - P_g)}{\phi''\mathcal{C}_g p} < 0. \quad (13)$$

<sup>1</sup> This is an approximation because one should use the certainty equivalent of the second period price rather than the expected value. Since the indirect utility function is convex in prices, the two are not the same.

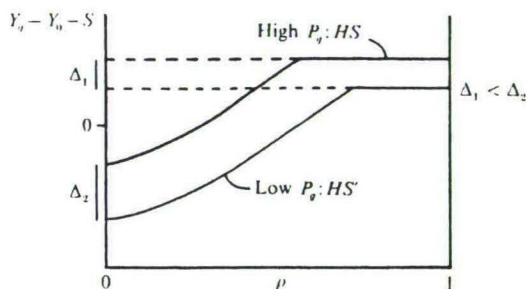


Fig. 1. Net aggregate supply and the probability of collapse.

If there is a collapse, anticipated capital gains will not materialise, because in that case controls remain. Therefore, a greater likelihood of collapse implies a greater likelihood of no price rise between today and tomorrow, and thus reduced hoarding incentives. So as credibility declines ( $\rho$  increases), hoarding declines and the observed supply response  $Y-S$  increases ( $HS$ , Hoarding Schedule, Fig. 1).

If credibility is very low, a corner solution may be reached where no intertemporal speculation is profitable,  $S = 0$  and  $\lambda > 0$  (the flat segment in Fig. 1). This will clearly obtain for the extreme case of no credibility at all ( $\rho = 1$ ). At  $\rho = 1$ , prices are not expected to rise, there will therefore not be any hoarding and the  $HS$  curve intersects the  $\rho = 1$  axis at  $Y_g$ .

Compare now two stabilisation programmes, each 'gradualist': prices are moved partially in period one but fully liberalised in period two. One programme is more gradualist than the other in that the initial price response is smaller ('Low  $P_g$ ' versus 'High  $P_g$ '). A higher first period control price  $P_g$  increases the optimal level of first period output for given incentives to hoard (cf. (5)). This means that the flat part of the hoarding schedule (where hoarding is zero and output at  $Y_g$ ), shifts up by the increase in  $Y_g$ :

$$\Delta_1 = \frac{dY_g}{dP_g} = C_{YV}^{-1} > 0. \quad (14)$$

Also, higher initial prices mean lower percentage capital gains once the market is liberalised. Thus the incentive to hoard will decline:

$$\left. \frac{dS}{dP_g} \right|_{\rho \text{ cst}} = \frac{(\rho + \mathcal{E}_g p / P_g) \phi'}{\phi'' \mathcal{E}_g p} < 0. \quad (15)$$

Therefore  $\Delta_2 > \Delta_1$ , with  $\Delta_{1,2}$  defined as indicated in Fig. 1:

$$\Delta_2 = \Delta_1 - \left. \frac{dS}{dP_g} \right|_{\rho \text{ cst}} > \Delta_1. \quad (16)$$

$\Delta_2 > \Delta_1$  means that the curved segment of the diagram in fact shifts up more than the flat part. This implies that the point where hoarding becomes unprofitable and  $HS$  flat moves to the left (cf. Fig. 1). Also, with a higher  $P_g$ ,



there will be less first period rationing, and hence less spill over into the market for second period home goods ( $E_{pp} > 0$ ). Thus  $p^*$  will be lower, further reducing hoarding incentives; hence the area where  $\lambda = 0$  shifts even further left. Thus for given collapse probability  $\rho$ , bolder decontrol programmes (larger initial price increases) will lead to less hoarding, larger increases in output, and as a consequence, much less problems with shortages.

## II. SHORTAGES AND THE PROBABILITY OF REFORM FAILURE

In most of the literature, credibility of policy reforms is exogenous. But assuming exogenous credibility clearly limits the usefulness of the analysis, since the impact of any policy will most likely depend on whether it is going to be sustained or not. Ize and Ortiz (1987) and Dornbusch (1989) endogenise credibility, linking credibility to various macroeconomic variables. The equilibria they consider have *prima facie* plausible features. But their reliance on an arbitrary relation between programme credibility and macro variables makes one wonder whether that relation itself, for all its empirical plausibility, would not be affected by economic policy.

In this paper we break new ground by drawing on recent innovations in the analysis of the impact of political considerations on economic policy. Intuition suggests a link between aggregate shortages in the early stages of the programme and the likelihood that the programme will be abandoned halfway. Reform programmes can be aborted for many reasons. Government officials may be bribed by lobbyists seeking the rents created by the price controls. A balance of payments crisis may make it impossible to continue the exchange rate policy on which many such de-control programmes are built. The political opposition may gather strength if the initial results are disappointing. We focus on the latter argument, arguably the most relevant one for Eastern Europe.

At the beginning of period 2, before the Government can implement the second stage of its reform programme, it faces a vote which determines whether it can continue or whether the opposition takes over in period 2.  $\rho$  is the probability that the latter happens. The key question is, what determines  $\rho$ ?

The vote is *de facto* a vote for or against price controls, since the opposition will reimpose (or continue) them. Voters vote for or against depending on the impact of controls in period 2 on their personal welfare. Price rises have a negative welfare effect proportional to the initial ration received. But they will be beneficial to the extent they raise supply, since at the margin, marginal utility of one extra unit ( $P_v$ ) exceeds the posted price  $P_0$ :

$$\begin{aligned} E_v \frac{dU}{dP_0} &= -A_R^h + (P^* - P_0) \frac{dA_R^h}{dP_0} \\ &= -A_R^h + (P_v - P_0) \alpha. \end{aligned} \quad (17)$$

We parameterise divergence of views by assuming that voters have different priors on the aggregate supply elasticity in the controlled sector. There is a

continuum of voters, indexed by  $s$ . Define  $\alpha = d(Y - S)/dP$ . Voters enter period one with a particular prior distribution on  $\alpha$ , and observe output response in period one. They use that information to update their prior into a posterior distribution used to assess the welfare effects of controlled versus uncontrolled prices in period 2. In updating their prior, voters use Bayes' rule. They are ranked in ascending order of their prior belief on the value of  $\alpha$ . Equation (17) yields the  $\alpha$  at which price changes have zero welfare effect,  $\alpha_c$ :

$$\alpha_c = \frac{A_R^h}{(P_v - P_0)}. \quad (18)$$

Welfare maximising voters will vote yes or no depending on whether their posterior mean is greater or smaller than  $\alpha_c$ .

There is simple majority voting, and voters' preferences over the various alternatives are single peaked. Therefore the median voter,  $s_m$ , casts the decisive vote.<sup>2</sup> Voters know their own estimate of  $\alpha$  and form rational expectations about economic aggregates, but they do not know every other voter's estimate of  $\alpha$ . In particular they do not know the magnitude of  $\alpha(s_m)$ , the median voter's estimate of the supply elasticity. Voters' beliefs on the magnitude of  $\alpha(s_m)$  are summarised by a density function  $f$ , which we assume to be the same across voters.<sup>3</sup> Since the median voter determines the election outcome, the probability that the Government will be voted out before the second part of its decontrol programme equals the probability that  $\alpha(s_m) < \alpha_c$ :

$$\rho = \Pr(\alpha_{s_m} < \alpha_c) = \int_{\alpha_{s_m} = -\infty}^{\alpha_c} f(\alpha_{s_m}) d\alpha_{s_m}. \quad (19)$$

To assess how hoarding in period 1 affects the probability of collapse of the programme of price decontrol, consider how the updating process will affect  $f(\alpha_m)$ . Voters do not know each other's individual preferences, but they do know that each voter updates his prior with Bayesian updating. Updating will shift  $f(\alpha_m)$  such that  $f$  contracts towards the voter who has a prior mean equal to the value observed in period 1. But the voter with prior mean  $\alpha_c$  is more relevant, since that is the cut-off point for the voting procedure.

The voter at  $\alpha_c$  will shift up, down or stay where he is depending on whether the observed supply elasticity in period 1 exceeds, falls short of, or equals  $\alpha_c$ . All voters whose prior mean exceeds the supply elasticity actually observed in period 1 revise their estimate of  $\alpha$  downward. Thus if enough hoarding takes place to make the net supply response smaller than  $\alpha_c$ , the voter with prior mean equal to  $\alpha_c$  shifts to the left and more weight is concentrated in the part of  $f$  defined over  $(-\infty, \alpha_c)$ . The probability of collapse therefore increases if there is enough hoarding to cause a *net* supply response below  $\alpha_c$  and *vice versa* if the actual supply response exceeds  $\alpha_c$ . With  $f'$  the distribution function of  $\alpha_{s_m}$

<sup>2</sup> A vote early in a major reform programme is likely to be dominated by whether voters do or do not support the programme. With such a single issue contest, median voter models are plausible descriptions of how voting mechanisms are likely to work (cf. Enelow and Hinrich (1984)).

<sup>3</sup> A similar assumption is used in Alesina and Cukierman (1990).



after the shift triggered by the incorporation of new information at the end of period 1, we get:

$$\left. \begin{aligned} f(\alpha_{sm})' &= f(\alpha_{sm} + \Delta_{sm}); \quad \Delta_{sm} = (1 - \psi) \left( \frac{Y_g - Y_0 - S}{P_g - P_0} - \alpha_{sm} \right) \\ \Rightarrow \rho(Y_g - Y_0 - S) - \rho[\alpha_c(P_g - P_0)] &= \int_{\alpha_{sm} = -\infty}^{\alpha_c} [f(\alpha_{sm})' - f(\alpha_{sm})] d\alpha_{sm} \\ &= \int_{\psi\alpha_c + (1-\psi)\frac{Y_g - Y_0 - S}{P_g - P_0}}^{\alpha_c} f(\alpha_{sm}) d\alpha_{sm} \\ &> 0 \quad \text{if } (Y_g - Y_0 - S)/(P_g - P_0) < \alpha_c \\ &< 0 \quad \text{if } (Y_g - Y_0 - S)/(P_g - P_0) > \alpha_c \end{aligned} \right\} \quad (20)$$

Equation (20) indicates a negative relation between  $\rho$  and net aggregate supply response (the schedule *VDS*, for Voters Dissatisfaction Schedule, in Fig. 2.

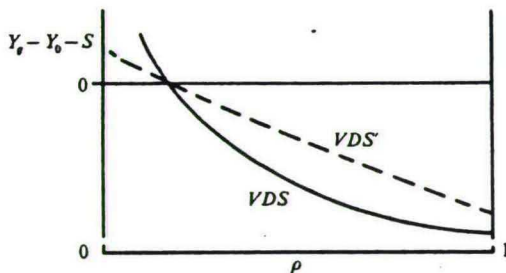


Fig. 2. Impact of aggregate supply response on collapse probability.

Which way will this locus shift when a more gradual reform is implemented (i.e. a smaller price increase  $(P_g - P_0)$  in period 1)? Differentiating (20) indicates the answer:

$$\frac{\partial[\rho(Y_g - Y_0 - S) - \rho[\alpha_c(P_g - P_0)]]}{\partial P_g} = \frac{f\left(\frac{Y_g - Y_0 - S}{P_g - P_0}\right)(Y_g - Y_0 - S)(1 - \psi)}{(P_g - P_0)^2} \quad (21)$$

$$\begin{aligned} &< 0 \\ &> 0 \end{aligned} \Leftrightarrow (Y_g - Y_0 - S) \begin{cases} < 0 \\ > 0 \end{cases}$$

For any given net supply response larger than zero, the same quantity response to a smaller price change implies a larger elasticity and thus a larger upward (or smaller downward) revision from any given prior. This in turn implies a larger shift to the right of the probability density function  $f$  and hence a steeper decline in  $\rho$  (see the part of *VDS'* above 0 in Fig. 2). A similar line of reasoning applies to the case of negative supply response. Any given negative response represents a more negative supply elasticity than the corresponding one for the high  $P_g$  case since for the same quantity response the price change

is smaller. This implies a larger shift to the left (downward revision of prior means) and thus a higher collapse probability in the low  $P_g$  case than in the high  $P_g$  case. All this makes for a counterclockwise rotation of the  $VDS$  schedule, to  $VDS'$  in Fig. 2, in response to a more gradualist (lower  $P_g$ ) decontrol programme.

### III. GRADUALISM, HOARDING AND THE POLITICAL ECONOMY OF PRICE REFORM

With the two building blocks (the Hoarding Schedule  $HS$  and the Voters Dissatisfaction Schedule  $VDS$ ) derived, we can examine the consequences for credibility and supply response of a gradual price decontrol programme.

$HS$  in Fig. 3 indicates, for a given collapse probability  $\rho$ , how much producers choose to hoard. A higher collapse probability leads to lower expected future prices and thus gives less of an incentive to hoard. The  $HS$  locus therefore slopes up. But more hoarding lowers the *perceived* supply elasticity and therefore strengthens the voters' assessment that the programme is failing; this in turn increases the probability that the Government will be voted out. Thus the political economy schedule  $VDS$  slopes downward.

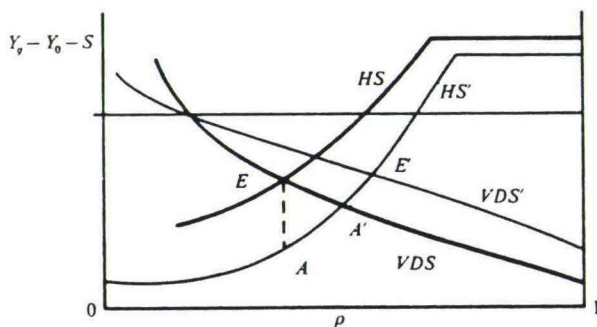


Fig. 3. Hoarding, collapse probabilities and price decontrol: a rational expectations equilibrium.

Rationality requires that the probability of programme collapse used in producers' hoarding decisions will indeed come out if those hoarding decisions are in fact implemented. This will be the case at  $E$ , the intersection of the Hoarding Schedule and the Voters Dissatisfaction Schedule. Thus  $E$  represents a rational expectations equilibrium for a given gradual decontrol policy that sets first period prices at  $P_g$  and promises to liberalise in period 2. At  $\rho_E$ , producers hoard  $S_E$  for a total (negative) supply response  $Y_{g,E} - Y_0 - S_E$ . In turn, such a negative supply response leads to a private revision of the collapse probability that exactly matches  $\rho_E$ .

The equilibrium at  $E$  has many plausible features. Output rises, as current prices increase.<sup>4</sup> Thus the initial unemployment costs of such a decontrol will

<sup>4</sup> See Ortiz (1990), Bresser (1987) and Helpman (1988), on respectively Mexico, Brazil and Israel. In each case, substantial price increases initiated what was announced as a temporary use of price controls.

be quite small or even absent. However, in spite of increased output and higher prices, net supply actually reaching the market declines as producers increase inventories, hoping for later capital gains. Therefore, shortages develop, to the point that the net observed supply elasticity is in fact negative. This in turn generates pressure against the decontrol policy, increasing the probability that the programme will have to be abandoned for a prolonged period of controls before the final deregulation phase is reached.

Consider the consequences of a more cautious start of the programme (a lower initial period level of the controls). A lower initial price, for given collapse probability  $\rho$ , results in larger capital gains once prices are liberalised. Thus for given  $\rho$ , hoarding will in fact increase:  $HS$  shifts down to  $HS'$  in Fig. 2. If  $\rho$  would not change, the new equilibrium would be at  $A$  in Fig. 2. Of course more hoarding implies a more negative perceived supply elasticity, which in turn leads to a higher  $\rho$ . Thus, if the  $VDS$  schedule itself would not shift, a new equilibrium would emerge at  $A'$ , with more hoarding and higher collapse probability:  $\rho_{A'} > \rho_E$ .

But there is more: for given *net* aggregate supply response, a lower elasticity is implied, because it is in response to a smaller price change; priors thus get revised downwards more than they would under the less gradual decontrol programme and *the collapse probability increases* ( $VDS$  shifts out to  $VDS'$ ). Thus the new equilibrium is at  $E'$ , with an unambiguously higher probability of collapse:  $\rho_{E'} > \rho_{A'} > \rho_E$ . *Thus a more gradual approach to price decontrol actually increases the collapse probability.*

However, although there will be an unambiguously lower output response to more gradual decontrol, the impact on net aggregate supply is less clear. On the one hand, there is more hoarding for given  $\rho$  since the capital gain then increases; but on the other hand there will be less hoarding because  $\rho$  increases, thus reducing the likelihood that this larger capital gain will in fact materialise. But it is clear from Fig. 2 that the net supply response inclusive of hoarding will remain negative if it was so to begin with.

The same machinery can be used to assess 'cold turkey' decontrol approaches (Fig. 4). Under a cold turkey approach, prices are immediately and fully

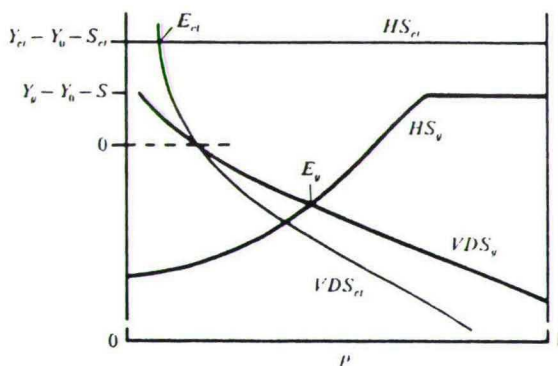


Fig. 4. Cold turkey versus gradual price decontrol.



liberalised. Thus if the approach is maintained, prices will be market determined in both periods. Under the assumptions made, the first period free market price  $P^*$  will equal the second period price  $p^*$ . Thus without credibility problems, there would be no hoarding, as waiting for tomorrow will not bring higher prices to offset storage and interest costs.

Credibility problems strengthen this result. If  $\rho > 0$ , there is a positive probability that second period prices will be *lower* than first period prices, in case controls get reimposed; this would lead to capital *losses* on inventories carried into period 2. Thus with a 'cold turkey' approach, there are strong *disincentives* to hoard.

Therefore, if dis-hoarding would be possible, a cold turkey approach would lead to a much larger observed net supply response than under gradualism. This is because in that case, if there is any credibility problem at all, goods will in fact be pulled out of inventories, for sale today rather than tomorrow. But dishoarding is not possible in our set-up, so under 'cold turkey' decontrol, the zero-inventory-build-up case ( $\lambda = 0$ ) will always obtain. This means that the line labeled  $HS_{ct}$  in Fig. 4, a horizontal line at  $Y_{ct} - Y_0 > Y_g - Y_0 > 0$ , represents the cold turkey case. *Thus there will be no hoarding under the cold turkey approach.*

The second clear result relates to credibility (the equilibrium value of  $\rho$ ). Since  $P^* > P_g$ , the  $VDS$  schedule rotates further, clockwise and still crossing the same zero point (compare  $VDS_{ct}$  with  $VDS_g$  in Fig. 4). The cold turkey equilibrium is at the intersection of  $VDS_{ct}$  and  $HS_{ct}$ , at  $E_{ct}$ . Since there is no hoarding under a cold turkey approach, there will be a high observed supply elasticity and thus a low probability of programme collapse  $\rho_{ct}$  (lower, for example, than  $\rho(0)$ ).

For comparison of the cold turkey decontrol strategy with a gradualist approach, consider two possible configurations for the latter. If the initial distortion is so small that there would be no hoarding at all in the gradual case either (i.e.  $\lambda = 0$  and net supply equals  $Y_g$ ),  $C_{YY} < 0$  would imply a smaller supply response per unit of price increase than observed under the *CT* approach. This in turn would imply a larger assessed probability of collapse. So even if there is no hoarding under gradualism (mild initial distortions and  $\lambda = 0$ ), gradual programmes will be less credible than cold turkey programmes if  $C_{YY} < 0$ . Moreover, since  $\lambda = 0$  cases have been excluded (we only consider severely distorted cases), there will always be hoarding under gradualism. Therefore, there is more of a downward revision of the supply elasticity than in the  $\lambda = 0$  case, reinforcing the result just derived for the  $\lambda = 0$  case. In terms of Fig. 4,  $HS_g$  falls below the line  $Y_g - Y_0$  at least for its initial segment, and cuts  $VDS_g$  more to the right. But a lower observed supply elasticity implies a higher likelihood of programme collapse!

If a negative initial supply response obtains for the lower ranges of  $\rho$  ( $HS$  cuts the left vertical axis below 0), the results are unambiguous: since the cold turkey equilibrium is to the left of  $\rho(0)$  while the gradualism equilibrium in that case is to the right of  $\rho(0)$ , the collapse probability under gradualism is always higher, whatever the sign of  $C_{YY}$  is (cf. Fig. 4).

Thus cold turkey programmes will unambiguously be more credible than gradual programmes that actually cause increasing shortages in their initial phase ( $\rho_{E_0} > \rho(0)$ ); and even if gradual programmes do not cause increasing shortages ( $\rho_{E_0} \leq \rho(0)$ ), cold turkey decontrol programmes will still be more credible if  $C_{YYY} < 0$ .

#### IV. CONCLUSION

Should price controls be abolished 'cold turkey' or can a case be made for gradualism? Two factors complicate the issue and are at the core of this paper. Price controls often focus on commodities that are storable and can thus be used in intertemporal speculation. Second, opposition to dismantling of controls is often based on claims of low supply response, and greatly bolstered if a strong supply response fails to materialise. This is especially relevant in Eastern Europe, where experience with markets is limited.

We show the difficulties that these two factors create for gradual decontrol of prices. We endogenise the probability of a collapse of the reform programme and show that such endogeneity in the presence of intertemporal speculation leads to a strong case *against* gradualism. The smaller the initial price increase, the lower the observed supply elasticity and the greater the probability that the programme of reform will be abandoned.

This implies that the policy that makes most sense from a microeconomic point of view (decontrol immediately) is also advisable from a macroeconomic point of view. Credibility problems, which are at the core of the transitional output losses that characterise most stabilisation programmes, will be much less under a cold turkey approach and so will therefore transitional unemployment.

*The World Bank and CEPR*

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